MASTER'S THESIS

Investigation of Australian IPOs: road blocks to becoming a public company.

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BOND UNIVERSITY

Master of Philosophy Thesis

by

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Investigation of Australian IPOs:

Road Blocks to becoming a Public Company

Submitted in total fulfilment of the requirements of the degree of

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Abstract

This study investigates the factors that influence the completion of an initial public offering (IPOs) on the Australian Securities Exchange (ASX). We use a probit regression model to analysis the effect of News Coverage on withdrawal likelihood, we find that News Coverage around the time of an issuing firm's IPO is positively related to IPO completion. News coverage enables a greater dissemination of information related to the company and the IPO, which in turn reduces information asymmetry. In line with previous finding of Boeh and Southam (2011), news articles also arguably signal lower agency costs and therefore can also be linked to a higher probability of IPO completion. Mahalanbis distance matching approach was adopted to match each company that withdrew its offering from the ASX with a similar company that had a successful IPO during the same period. We use this matching technique to explore partially underwritten IPOs, which is where only a proportion of an IPO is underwritten. We find that almost 20 percent of companies that were not underwritten withdrew their offerings, compared to less than 10 percent of companies that were partially underwritten. With a fully underwritten IPO, the underwriter who takes title to the firm's shares would bare the risk of undersubscription and it appears that being partially underwritten would therefore remove at least some of this risk.

Keywords: Initial Public Offering, IPO, Withdrawal, Australia, ASX, Capital Raising, Nearest-Neighbour Matching, Propensity Score Matching, Underwritten IPOs, Media Coverage, News Articles

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Declaration

This thesis is submitted to Bond University in fulfilment of the requirements of the degree of Master of Philosophy by Research.

I declare that the research presented within this thesis is a product of my own original ideas and work, and contains no material which has previously been submitted for a degree at this university or any other institution, except where due acknowledgement has been made.

Name: Paul Kelly

Signature:

Date: March 1, 2017

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Abbreviations

ABN: Australian Business Number

ASIC: Australia Securities and Investment Commission

ASX: Australian Securities Exchange

ATE: Average Treatment Effect

ATET: Average Treatment Effect on the Treated

BICS: Bloomberg Industry Classification System

CFO: Chief Financial Officer

D/E: Debt to Equity Ratio

GFC: Global Financial Crisis

IPO: Initial Public Offering

PDS: Product Disclosure Statement

PSM: Propensity Score Matching

NNM: Nearest-Neighbour Matching

US: United States

Investigation of Australian IPOs: Road Blocks to becoming a Public Company

Chapter 1

1.1 Introduction

The initial public offering (IPO) is an important financial issue for companies, investors, and academics. As the name suggests, an IPO is the first sale of stock by a private company to the public domain, which enables the stock to trade on an exchange such as the Australian Securities Exchange (ASX). The IPO is a key milestone for many privately held companies as it provides access to a large public capital market and it provides the investor with a liquid security with an established market value. Since Ibbotson's (1975) seminal paper on the risk and performance of IPOs identified the importance of initial public offering research, this topic has become very well documented in the finance literature.

A company will 'go public' for several reasons, including raising capital and building a public profile. Typically, IPOs are conducted by small, early-stage companies seeking capital to expand their businesses and provide a way for their early-stage investors to monetise their initial investments. The IPO will attract attention from the financial media which can also enhance the company's image and reputation. Following the IPO, companies usually list their shares on a stock exchange to facilitate the trading of the stock. It may also improve the company's corporate image and brand awareness since listed companies tend to be more closely watched by the financial media and are better able to have their information disseminated, i.e., through data aggregators such as Bloomberg. Large privately-owned companies might also conduct IPOs to obtain a market valuation and build a stock-based long-term incentive plan.

In Australia, an offer is underwritten by the use of a 'standby' agreement, which is similar to the firm commitment agreement in the United States (US) which stipulates that the underwriter will purchase the balance of any unpurchased shares in the IPO. Companies within Australia use one of two methods when issuing new shares. The first is an 'open' priced offer, incorporates 'book building' through the institutional offer period; typically, this is used for very large floats and involves a price discovery process. The second is the most commonly used 'fixed' price offering.

There are significant one-time and ongoing costs with going public and being a publicly listed company. The cost of listing on the ASX can be substantial with initial listing fees of $475,000 and an additional $75,000 annually for a firm valued at $1,000 million. Costs also include the appointment of a team of advisers and experts: including

accountants/auditors, corporate advisers, lawyers, and underwriters. Regulatory agencies (e.g., Australian Securities and Investment Commission (ASIC)) and disclosure requirements (e.g., quarterly and annual reports and shareholder meetings) require additional direct costs. Indirect costs associated with the IPO (e.g., management time) are also substantial.

A hidden cost that exceeds the other issue costs is the dilution of share value associated with short-run underpricing which is characterised by the pattern of positive average initial stock returns with initial return being defined as the percentage change between the offering price and the closing price on the first trading day. Underpricing has been well documented in the literature with Ibbotson (1975) reporting that IPOs in the 1960's in the United States (US) were underpriced by approximately 11.4 percent. Extensive studies by Ritter (1984), Smith (1986), Ibbotson, Sindelar, and Ritter (1994) and most recently Ritter and Welch (2002) all found average underpricing levels beyond 15 percent within the U.S. Additionally, Ibbotson (1975) reporting that only 16 percent are accurately priced. The average level of underpricing in Australia has been reported by Loughran, Ritter, and Rydqvist (1994), a paper which was updated May 2015, to be 21.8%, this number has been calculated incorporating underpricing numbers from Lee, Taylor and Walter (1996) which sampled 1,562 companies from 1976 to 2011.

According to Ibbotson, Sindelar, and Ritter (1988), the pricing of IPOs is 'difficult, both because there is no observable market price before the offering and because many of the issuing firms have little or no operating history. If the price is set too low, the issuer does not get the full advantage of its ability to raise capital. If it is priced too high, then the investor would get an inferior return and consequently might reject the offering.' It is evident that pricing is a critical aspect of having a well-functioning IPO market.

Rather than accept an underpriced IPO, a company may decide to withdraw the IPO, and this may have strategic implications for the firm. Firms that withdraw will forego the financing and other benefits associated with going public, and they also face other direct and indirect costs. The IPO process enlists the efforts of company managers, accountants, underwriters, printing companies, and legal advisors and is a time-consuming process with significant regulatory fees. Additionally, a failed IPO can also damage the firm's reputation; Dunbar and Foerster (2008) finds that only 9% of issuers that withdraw return to successfully conduct an IPO, Boeh and Dunbar (2013) state that 13% return for a successful IPO, suggesting that withdrawal may preclude future access to the public capital markets. Alternatively, Boeh and Dunbar (2013) shows that companies apart from those who

successfully return for an IPO, valuations from post withdrawal event are significantly discounted.

One should not mistakenly conclude that only poor-quality firms withdraw their IPOs. In 1998, Goldman Sachs withdrew its IPO, citing 'poor market conditions'. Rather than accept a low valuation (15 billion USD), the company withdrew its IPO. The following year, Goldman returned for a successful IPO with yielded a market valuation of 35 billion USD, based on the first day of trading. Prior to the IPO, the company can elect to withdraw the offering from the market for several reasons, including unfavourable market conditions.

US IPOs are heavily studied, yet withdrawals are not, even though withdrawal is a frequent outcome. Studies in the finance literature e.g. Busaba, Benveniste, and Guo (2001); Dunbar (1998); Boeh and Southam (2011); Boeh and Dunbar (2016) report that the rate of failed US IPOs has increased considerably since the 1980s, and approximately one third of all IPOs are withdrawn prior to completion. To the best of our knowledge, there have been no studies on withdrawn IPOs in the Australian market, but our data suggests that the percentage of withdrawn IPOs is significantly lower, 3-17% for the period from 2004 – 2014.

Busaba et al. (2001) equate the ability of firms to withdraw poorly received offerings to an option; if the firm perceives the offer price to be too low, it has the option to simply withdraw the offering and walk away from the current IPO process. The existence of this withdrawn IPO option presents the opportunity for us to analyse the costs and benefits of going public. Busaba et al. (2001) equate the firm's initial IPO filing to be the equivalent of purchasing a call option. One reason owners and entrepreneurs of the IPOs would be willing to withdraw is the existence of superior alternative sources of financing such as lines of credit or additional private equity. It may be the case that some companies may explore the possibility of listing while simultaneously exploring other opportunities and come to the determination that better terms are available elsewhere (Boeh & Dunbar, 2013). Alternatively, the owner's private information might not be reflected in the offering.

By matching each withdrawn company with a similar company that has had a successful IPO, we can gain insights into the withdrawal decision. This thesis employs a probit regression analysis and the Mahalanobis distance matching technique to deal with selection bias. This technique is used in conjunction with prohibit regression-based model to identify which baseline factors relating to the IPO issuing company, or the IPO details are confounding factors which need to be controlled for. Matching each firm that has withdrawn its IPO from the ASX between 2004 and 2014 with a comparable company that had a successful IPO on the ASX allows unbiased estimation of the impact of the factors of interest

on the withdrawal likelihood. Tracking of withdrawn companies provides an insight into the effect of withdrawal on a company's future within the Australian context. To assess the impact of potential road blocks to going public, companies will be matched on certain baseline attributes relating to the company and the initial public offering as well as the reason the company is raising capital. These attributes were identified as having an impact on withdrawal and thus by matching the companies that are most similar regarding these attributes we remove selection bias that would otherwise be present.

The analysis presented examines the effect of having no media attention on withdrawal probability. Furthermore, we examine the effect of IPO being partially underwritten withdrawal probability. In each instance, the increase or decrease in the probability of the IPO being withdrawn is quantified.

The determination of the quantum of the probability increase or decrease is aimed at providing further insight into IPO design and factors that influence IPO completion. The development of this measure provides further opportunity to analysis the relationship between the increase or decrease of the risk of withdrawing to the cost of being partially underwritten or costs involved in generating media attention. To date, research has not been conducted to evaluate the extent of any factors on withdrawal likelihood.

Prior research on media in Australian IPOs examined the effect of optimistic news stories on first-day pricing of IPOs between 1995 and 2005 (Carey, 2016; P. J. Lee et al., 1996). We explore the notion that news articles aid in information dissemination which increases IPO completion rates.

This study examines the notion that news coverage is an important mechanism for information dissemination which is key in overcoming asymmetric information, allowing for greater exposure of the company's IPO. While these reasons can be speculated upon the emphasis of this thesis is to examine whether the news coverage impacts on the probability of withdrawal.

The second emphasis of this thesis is to examine the value in having an initial public offering partially underwritten. It is evident having an IPO fully underwritten removes the risk of the IPO being undersubscribed as the underwritten has agreed upon the purchase and resale of all the shares or the purchase of the remaining unsold shares. One would assume that being partially underwritten would, therefore, remove some risk associated with undersubscription of the IPO. This thesis attempts to quantify that risk reduction regarding the impact on the probability of withdrawal.

1.2 Motivation

IPO studies have received wide interest, with reviews completed by Ritter and Welch (2002), Kent (2002), Ritter (2011) and Ritter (2015). Analysts, investors and executives consider the IPO to be a key capital raising decision.

Investigating the costs versus benefits of Australian IPOs has practical implications. The ASX Listings and Issuer Services Management has provided us with a list of their most pressing research questions and their top priority is to understand the costs and benefits of being an ASX-listed firm. This question has ties into the entrepreneurial landscape and is important to the more than 2,000 firms that are currently listed on the ASX and to the thousands of Australian start-ups that at some point in time will contemplate a listing.

There is a large degree of heterogeneity in IPOs in different countries. A key difference between the Australian and the US IPO market is the structure of the issuing methods. In the US, the bookbuilding method is the preferred offering mechanism, whereas within Australia the fixed pricing method is preferred. The fixed price method is said to be an important difference between the Australian and the prevailing U.S. environment, where subscription prices are often not determined until (non-binding) offers have been received from potential subscribers (P. J. Lee et al., 1996) citing (Hanley, 1993); (Suchard & Singh, 2007). These institutional differences are explored and help direct the inferences we draw from our findings.

The fixed price method sets the issuance price prior to the listing announcement. Whereas, the bookbuilding method sets a range of prices with the final offering price set at the end of the marketing period. The key difference with the bookbuilding method that is commonly used during the roadshow process within the U.S. is that bidding information is not share between participants, whereas the ASX bookbuilding facility offers a live feed of the bidding information as it's generated, this is intended to reduce information asymmetry between participants.

In Australia, not all IPO's are underwritten, and a fixed price offering is the preferred method as opposed to book building which predominates in the US. In addition, Australian regulation makes it illegal for aftermarket manipulation to occur while in the US, it is common for the underwriter discourages 'flipping' (the immediate selling of stock in the aftermath that were bought at the IPO price); this controversial practice carried out by large institutional investors as well as small traders and accounts for 60 to 70 per cent (Aggarwal, 2000) of first day trading volume. Furthermore, it is common practice for Australian IPO

applicants to include earnings forecasts in their prospectus as it is perceived to be intended practice by law where in the U.S., it is quite rare for a firm to disclose such information.

This research is motivated by the need to understand the costs and benefits of Australian IPOs. Given the costliness of the IPO process, we hope to shed light on how firms can improve their prospects for a successful IPO.

1.3 Contribution

We study withdrawn Australian IPOs with the hope of better understanding the withdrawal decision and the costs and benefits of being listed on the ASX. Through this, we contribute to the literature in several ways. Most importantly, this constitutes the first study of withdrawn IPOs within the Australian market. Additionally, no studies have been conducted that test the impact of being partially underwritten or the role of media coverage on the completion of an IPO.

An ongoing issue with IPO research is that it focuses on US firms; in (Ritter & Welch, 2002) highly cited Journal of Finance review, they acknowledge this 'U.S.-centric point of view'. While the U.S. IPO literature is expansive, there are relatively few international studies (most focus on underpricing) and only a handful of Australian IPO studies. The proposed study serves to fill this gap in the literature.

Our study finds that 11.38% of Australian firms withdraw their IPOs during the period from 1 January 2004 to 31 December 201. Given this prevalence, we examine several determinants of IPO withdrawal/completion, including how no media coverage at the time of the IPO increases withdrawal likelihood by 13.03%.

Our sample is large (865 deals), recent (2004 – 2014), and includes periods before, during and after the 2007 – 2008 Global Financial Crisis (GFC). Much of the data has been hand-collected from prospectuses filed with the Australian Securities and Investments Commission (ASIC). This study finds that no media coverage is found to be a significant determinant affecting withdrawal probability for companies undertaking and IPO. Also, we find that whether the IPO is partially underwritten has a significant determinant impact on withdrawal probability; in each instance, we quantify the effect these factors have on withdrawal probability. These appear to offer several potential measures for future Australia IPO studies. They also allow companies to carefully consider these factors when undertaking an IPO and on the design of their offerings accordingly.

Chapter 2 - Literature Review and Hypothesis Development

2.1 Rationale for the Initial Public Offering

A start-up company may quickly exhaust the founders' personal savings yet need more capital to fund the growing business. Bank loans are a common, quick and easy way to raise capital, but the cash-draining interest costs that accompany debt can be prohibitive. The company may consider private placement with a few small investors (‘angels’) or venture capitalists, but these alternatives may be accompanied by a demand for controlling equity interest which would result in ownership dilution and a significant loss of power. If the company is large enough, it may consider selling shares to the general public at an initial public offering (IPO). Ritter and Welch (2002) state that the choice to go public in most cases is motivated by the desire to raise equity capital as well as the preference of risk averse major initial shareholders to diversify their personal portfolios or exit the company and seek a public market to convert their wealth into cash. However, Gilson and Black (1998) show that entrepreneurs frequently take back control from venture capitalist at the time of IPO. Ritter and Welch (2002) also state that non-monetary reasons (i.e., desire to increase the firm’s public profile) play only a small role in the decision to IPO.

In their twelve European country investigation of the decision to go public, Bancel and Mittoo (2009) survey chief financial officers (CFOs) and report that enhanced visibility and financing for growth as the most important motivating factors which is consistent with U.S. studies as summarised by Brau and Fawcett (2006). However, European firms differed significantly on outside monitoring which was considered a major benefit by European CFOs but a major cost by U.S. CFOs. Bancel and Mittoo (2009) results suggest that the decision to go public is a complex one, and cannot be explained by one single theory because firms seek multiple benefits in going public. These motivations are influenced by the firm’s ownership structure, size, and age as well as by the home country’s institutional and regulatory environment.

2.2 IPO Process

In Australia, it is common for a new company to be created for the sole purpose of acting as a listing vehicle. In this situation, existing shareholders dispose of their shares to the new company rather than to the public. The primary reason for utilising this structure is to limit prospectus liability for the shareholders; this refers to the automatic personal liability that applies to directors of the company for issuing a defective prospectus.

In Australia, a company is required to prepare a prospectus, under which it will offer the shares to the public. This prospectus contains is required to contain all information that

investors or their professional advisers would reasonably require, and reasonably expect to find in the prospectus, to make an informed assessment of material matters relating to the company including: the assets and liabilities, financial position, profits and losses and prospects of the company; and the rights attaching to the securities being offered (Piper, 2015). It is also common that an issuing firm includes forecasts in the prospectuses in Australia. How, Lam and Yeo (2007) found that these forecasts are strongly associated with the average Price to Earnings and Price to Book multiples of two comparable firms (matched on industry, growth, and size). The type of information with an issuing firm's prospectus has found to be an informative predictor of firm survival. A. P. Lamberto, S. Rath (2008) found that the number of risk factors contained within a prospectus and the size of the firm are negatively related to survival of the firm, whereas, size of the offering and forecast dividend yield are positively related to firm survival.

2.2.1 Underwriting Agreement

The prospectus will also contain the details of the underwriting agreement if the issue is underwritten. The negotiations and finalisation of the underwriting agreement typically occurs a several weeks before the prospectus is lodge with ASIC. An offer is underwritten by the use of a 'standby' agreement, which is similar to the firm commitment agreement in the U.S. The standby agreement stipulates that the underwriter will purchase the balance or a of any unpurchased shares in the IPO. Alternatively the agreement may stipulate that the issue is partially underwritten. This is where the underwriter underwrites the issue up to a certain number of securities or a particular amount, refered to as the underwritten amount. Contrary to an agreement made in the US, in Australia the guarantee made by the underwriter to underwrite the issue is negotiated and given before the propespectus is lodge with ASIC. This can be contrasted against the timing of the guarantee given by underwriters in the US, these arent The underwriting agreement may also contain an out clause which specifies how the underwriter can escape the agreement, for example, the S&P ASX 200 Index is for 5 or more days at any time after the date of the undewriting agreement 95% or less than its respective level as at the clsoe of business on the business day prior to the date of the underwriting agreement.

2.2.2 Offer method

Companies within Australia use two main methods for issuing new shares. The first method is an 'open' priced offer; also known as a bookbuilding offer, and the second is a 'fixed' price offer. The open price offer which is typically used for very large listings in Australia consists of two periods; the first is an institutional offer period. This period consists

of a bookbuild, which is a method of surveying institutional investors where they provide an indication of the number of shares they would like to take up and the price at which they are prepared to pay. This method is intended to maximise the offer price because the investment bank builds a book of demand for the shares in the IPO. Upon collections of the bids from investors the investment bank will close the book and set a final offer price (Busaba et al., 2001) This process can be utilised within the institutional marketing campaign which takes place before a prospectus has been lodged with ASIC, and can be used to determine the fixed price that will be contained in the prospectus. Alternatively, a price range can be specified in the prospectus with the final price set at the end the offer period, the minimum of which must be 20 cents. After the institutional offer period has expired, the retail offer commences; this period occurs after the company has lodged its prospectus with the ASIC which ensure that retail investors are fully informed because of the stringent reporting requirements. The prospectus may contain either a fixed price or a range of prices (PricewaterhouseCoopers, 2011).

The ASX Bookbuild Facility, launched by the ASX in October 2013, is a tool that brokers and investment banks can also utilise to help advise the IPO company on how to price and allocate the new shares to reflect market demand. This automated on-market bookbuild service was introduced to provide issuers of securities with an alternative to the existing off-market (e.g., the process happens behind closed doors) bookbuild processes commonly used when conducting capital raising. For the automated process to be utilised, the company must have already lodged a listing application and been assigned an ASX security code. The bookbuild takes place within parameters set by the issuer, including opening price and a minimum number of shares on issue. If the offering is open to retail investors, a disclosure document or product disclosure statement (PDS) or a document that is both must also have been lodged with ASIC.

The most commonly used offering method is fixed price which discloses a subscription price set by the underwriter (or corporate adviser) within the prospectus. This fixed price can be determined using an institutional bookbuild prior to the offer period, or the price can be determined using market research (PricewaterhouseCoopers, 2011).

If the fixed price offer method is used by a listing firm, they do not have the ability to change the price and quantity of shares on offer. This is said to be an important difference between the Australian and the prevailing U.S. environment, where the widely-used bookbuild method does not determine the subscription price until after (non-binding) offers

have been received from potential subscribers (P. J. Lee et al. (1996) citing Hanley (1993); Suchard and Singh (2007)).

Some research has identified the book building process as being more efficient than alternatives (Benveniste & Spindt, 1989) and further aided in the process of price discovery by investors placing limit orders (Cornelli & Goldreich, 2003). An additional feature of US bookbuilding is that they do not have to disclose issuer's reservation (offer) price in the regulatory filings (see your new table). Brisely and Busaba (2007) conclude that a policy of nondisclosure increases proceeds for firms who are most likely to be in the IPO market. This is another institutional difference that explains why bookbuilding is less common in Australia (Brisley & Busaba, 2007).

Table 1 – Contrasting Institutional Details Between Australia and US IPO Process

US	Australia
Underwritten contract type	
Best efforts. Underwriter does its best to sell the offering and receives fee in proportion to the issue distributed Brau and Fawcett (2006).	No equivalent
Firm commitment. Underwriter commits to purchase shares upfront then repackage and sell (distribute) them. Underwriter is liable for any shortfall in demand.	**Stand-by underwriting agreement.** Bancel and Mittoo (2009) is equivalent to firm commitment. Offer be either fully or partially underwritten.
	Fully underwritten. Underwriter commits to purchase any unsold shares.
No equivalent	**Partially underwritten.** Underwriter agrees to purchase any unsold shares up to the underwritten proportion agreed to in advance.
No equivalent	**Non-underwritten.** Offering sold through brokers; 18% of Australian IPOs are not underwritten (Piper, 2015).
Regulatory Filings	
Preliminary Prospectus. S-1 files prior to pre-selling; need not include offering price which is often changed (S-1A) prior to IPO (Hanley, 1993).	None. Prior to filing of prospectus, formal pre-selling is illegal J. How et al. (2007) and issue cannot be marketed to retail investors.
Prospectus must contain offering price and number of shares; file at last minute.	**Prospectus** must contain offering price (or range) and number of shares, neither of which can be changed. Filed in advance of IPO (e.g., 5-7 weeks).
Pricing	
Bought deal. Firm commitment offering where the underwriter sets price before approaching investors.	**Fixed price offering**. Price is provided in prospectus (and cannot be changed); 97% of deals in this study were fixed price deals.
Best efforts. Underwriter sets the price and quantity of shares to sell at the outset.	**Informal book-building**. Underwriters may undertake institutional book-building during pre-marketing phase prior to filing of prospectus.
Book-building. Roadshows used for price discovery and price set just prior to IPO.	**Open price offering**. Prospectus provides a range; only 3% of deals contain range (larger deals).
	ASX (online) **or formal underwriter book-build** occur after prospectus is filed; rarely used.
After-Market	
IPO occurs on first day of trading	IPO offering period begins 1 week after prospectus is issued and lasts 1-3 weeks for retail and 1 week for institutional prior to ASX trading.
Flipping is discouraged. Greenshoe is common.	Institutional investors can sell their shares and over-allotment option is very rare (Busaba et al., 2001).

2.3 Benefits and Opportunities of the Initial Public Offering

The IPO enables the private firm to access the public capital market through the sale of its stock. While the main reason for going public is argued by Ritter and Welch (2002) to be to raise new capital to finance growth, Kim and Weisbach (2008) find while analysing IPOs from 38 countries that while almost all firms going public raise a significant amount of new capital, not all of this is used for financing growth but some of the other reasons include increasing working capital and rebalancing leverage.

An established public market improves the company's future financial position, because it can offer investors a more liquid security with an established market value. Merton (1987) suggests that the IPO usually improves the company's net worth by reducing the cost of equity capital attributed to the increase in investor recognition and the increase in the shareholder base. The improvement in the debt-to-equity ratio opens the door to borrowing additional funds when the need arises. Pagano, Panetta, and Zingales (1998) state that this is the primary reason for Italian firms during 1982 and 1992 to go public and experience a reduction their in cost of credit after going public.

During the IPO process, the attention of the financial media focuses on the company providing free publicity which can also enhance the company's image and thereby strengthen the company's competitive position in the industry. With a public market for the shares, the company can include stock options in the compensation package which improves employee motivation and aids in attracting and retaining the best employees. Additionally, listing on a stock exchange may also improve the company's corporate image and brand awareness as listed companies are more closely watched by the financial media and are better able to have their information disseminated.

2.4 Costs and Obligations of the Initial Public Offering

There are numerous ongoing costs and obligations associated with being a publicly-traded company related to information disclosure to both investors and regulators.

Regulatory agencies (ASIC in Australia) require public disclosure of pertinent facts about the business, operations, management, shareholders, and financial position. These requirements may increase the company's dependence on accountants, auditors, lawyers, and outside advisors. Disclosure of information to shareholders through semi-annual and annual reports and shareholder meetings requires additional direct costs and management time and may result in lost

revenues associated with disclosing any proprietary information to the public (which includes direct competitors). Maksimovic and Pichler (2001) argue that the disclosure of this information may be advantageous to competitors. On the other hand, Jensen and Meckling (1976) argue that the increased disclosure requirements increase transparency and therefore, lower agencies cost and facilitate better corporate governance.

The cost of listing on the ASX can be substantial with the monetary costs including the appointment of advisers and experts; including accountants/auditors, corporate advisers, lawyers and underwriters. Typically, an underwriters fee is approximately in the range of 2% to 8% of the totally amount raised. The commission paid to underwriters is proportional to the risk of the issue, and owing to economies of scale, is also inversely proportional to the size of the offering (Ritter, 1987). Depending on the work involved and the size of the business ASX listing fees, fees incurred in hiring lawyers, accountants and experts, as well as registry and printing fees usually range from approximately $300,000 to $800,000. Larger IPOs can incur other fees that exceeding $1 million (PricewaterhouseCoopers, 2011).

Indirect costs associated with the IPO are also substantial. Enormous amounts of management time and effort are consumed by preparing for offering, but unfortunately, no data exists on the monetary equivalents of these costs. A hidden cost that exceeds the other issue costs is the dilution of share value associated with underpricing; this is an extremely important aspect of IPO theory that will be expounded upon in section 2.5 Short-run Underpricing.

Sometimes it may not be in the shareholders' best interests to issue stock. According to Myers and Majlui (1984), in cases where the inside managers know more than investors and believe their stock to be undervalued, it is preferable for the company to use debt rather than equity financing. If managers have 'used up their ability to issue low-risk debt', they advise turning down positive net-present value projects rather than finance them with risky securities as the costs of the IPO would outweigh the benefits. Lucas and McDonald (1990) developed an asymmetric information model where an IPO is deferred if owners of the firm know that it is currently being undervalued.

2.5 Short-run Underpricing ('Leaving Money on the Table')

Short-run underpricing is characterised by the pattern of positive average initial returns of the stock with initial return being defined as the percentage change between the offering price and the closing price on the first trading day. Underpricing has been well documented in the literature beginning with Ibbotson (1975), who first provided convincing evidence that IPOs, on average, were underpriced.

The average level of underpricing in Australia between 1976 and 2011 has been reported by Loughran et al. (1994) [updated December 2015] to be 21.8%; this number has been calculated incorporating underpricing numbers from Lee, Taylor & Walter (1996). Additionally, Ritter and Welch (2002) report that 70 percent of IPOs are underpriced and only 16 percent are accurately priced.

As an IPO is a common exit strategy for Venture capital (VC) backed firms, the sharemarket performance of these firms has been considered. This has been examined by da Silva Rosa et al. (2003) who found that the level of underpricing of these firm's IPO was not significantly difference from non-venture capital backed IPOs, further, they found that VC backed firms do not underperform in the after-market. There results conflict with the hypothesis that VC-backed IPOs are certified as high quality.

Many different models have been proposed to explain short-run underpricing with most focusing on important information asymmetries within and between the following market participants: the issuers; the underwriters; the initial investors in the IPO; and the larger set of investors in the secondary market. In the adverse selection model, some investors are informed while others are not; while in the moral hazard model, underwriters possess private and valuable information about the market; and in the signalling models, a small number of existing shareholders possess inside information about the company. The models generally assume that one group has superior information on firm value and that the other agents know this and behave accordingly. Each of the models can only cope with two relationships at a time and to simplify must ignore all other relationships.

2.6 Media coverage and IPOs

Lang and Lundholm (2000) examined corporate disclosure activity of 41 small companies in the US around season equity offerings and its relationship to stock prices. They suggest that the disclosures reduce information asymmetry inherent in the offering or 'hype' the

stock which ultimately may have successfully lowered the firms' cost of equity capital. Myers and Majlui (1984) argue that if information asymmetry cannot be resolved, issuing companies will view undertaking an offering of either debt or equity will be costly for existing shareholders. This motivates the managers to disclose informative news to mitigate against information asymmetry and therefore reduce the firms' cost of capital Lang and Lundholm (2000).

Media coverage plays an important role in the dissemination of information at the time of IPOs, but it is the nature of the news articles, informative or noninformative, that is critical in reducing the asymmetric information between the issuing firms and outside investors (Chahine, Mansi, & Mazboudi, 2015). Media coverage facilitates the formation of opinions by investors who otherwise would lack the required knowledge about the firm that is going public (Pollock & Rindova, 2003); (Rodgers, Skinner, & Zechman, 2016).

DuCharme, Rajgopal, and Sefcik (2001) extend the notion of hype by looking at the level of underpricing of IPOs of Internet companies and find that the greater the media exposure just prior to the offering the great the level of underpricing. The 'buzz' created by the media exposure is argued to create a market for the new firm's shares thereby leading on to more price run up on the actual day of the offer as the hype fuels momentum trading. The author suggests that the owners of the firm foregoes the potential incremental return which is created by the media attention as they want to leave a good taste in investors mouths as they anticipate an immediate need to return to the capital markets.

In the Australian context, Ho, Taher, Lee, and Fargher (2001) also examine the effect of media exposure on underpricing. The authors suggest that exposure in print and electronic media generates awareness among potential investors, which increases the level of demand for the newly listed stock. Like in DuCharme et al. (2001), they find a positive relationship between the level of underpricing and the level of media exposure. The second tenant is also similar in that it offers supporting logic for why the issuing company would leave money on the table.

Carey, Fang and Zhang (2016) analysed the impact of optimistic news stories on the first day underpricing of IPOs in Australia between 1995 and 2005. They find that optimistic news stories are negatively associated with IPO underpricing. They argue that issuing firms compensate investors for information asymmetry by lowering the issue price and thus 'leave money on the table' which causes underpricing. They look at optimistic news stories for 30 days prior to the listing date because as they state: 'IPO offers to retail investors start after the

lodgement of listing application and usually are open for 3–4 weeks'. They also state that where a fixed offer price is used, new stories preceding the IPO listing date is unlikely to be informative to professional investors but may play a role to retail or 'uninformed' investors. They argue that new stories are potentially an important source of information for uninformed investors. They then reference Rock's (1986) winners curse reiterating that uninformed investors may hesitate to participate in the subscription.

2.7 The Decision to Withdraw

At any time during the IPO process in the US until the shares are priced, and the underwriter commits to purchase the shares (typically the day before the offering) and in Australia at any time after the prospectus has been lodge with ASIC, the issuing company can simply elect to withdraw the offering from the market. Not only do companies that withdraw offerings forego the financing and other benefits associated with going public, but failed offerings also have other substantial direct and indirect costs. The IPO process itself enlists the efforts of a team of company managers, accountants, underwriters, printing companies, and legal advisors and results in substantial fees, and enormous amounts of management time and effort – most of which are not recoverable should the offering fail. A failed offering can also irreversibly damage the firm's reputation; Dunbar and Foerster (2008) find that only 9% of firms with withdrawn IPOs ever return to have a successful IPO suggesting that the market typically gives a company only a single chance to go public. Therefore, the largest potential cost of the failed offering may be that it severely limits the firm's access to capital from the IPO markets in the future.

In both Australia and the US, firms have the ability to withdraw IPOs when demand is weak. Busaba (2006) considers this to be a real option and therefore to have value. Busaba describes how the value of the option can vary depending on offering method. We believe that the value of the offering can also vary depending on regulatory frameworks. A key institutional difference between Australia and the US is the ability of US issuers to adjust the IPO price as described by Hanley (1993). We believe that the US firm's ability to adjust its price upwards could also be considered a real option; one that is not available to Australian firms. If this option were to be available, we hypothesise that fewer Australian firms would need to withdraw their IPOs since they could simply adjust their offer price after reading market sentiments. This is an institutional difference that explains why bookbuilding is less common in Australia.

Dunbar (1998) finds that offering size and underwriter reputation are significant determinants of completion, but reports that the impact is positive only for firm-commitment offerings, the mechanism used for most U.S. IPOs. However, Busaba et al. (2001) find that offering size and underwriter reputation are not key determinants of completion. Boeh and Southam (2011) introduce a typology of agency costs and signals that investors use to make decisions about the IPO. They argue that information about agency costs are contained within signals of levels of monitoring, information asymmetry, bonding, and incentive alignment. Their results show that where lower agency costs are signalled this is associated with a greater likelihood of IPO completion.

A company can choose to discontinue the IPO listing process citing a number of reasons, including unfavourable market conditions. According to studies in the finance literature (e.g., Dunbar (1998); Busaba et al. (2001)), a significant proportion (between 20% and 50% annually) of U.S. IPOs are withdrawn from the market prior to completion. No Australian studies have covered the Australian context, but data from 2004 to 2014 suggests that the percentage of withdrawn IPOs is almost 13%.

2.8 Australian IPO Literature

In Australia B. Dimovski and Brooks (2004) found that IPOs do not require stakeholder representation on the board of directors, these finding were contrary to previous finding that suggest the importance of stakeholder should be reflected in board representation. W. Dimovski and Brooks (2003) also explored underpricing and underperformance of Australian IPOs from 1994 – 1999 and found that these were underpriced and underperformed in the market in the first year following their listing. The authors explored the level of underpricing dependant on whether the firm was a No Limit Liability company or Limited Liability company.

Balatbat, Taylor, and Walter (2004) explored ownerships structure and corporate governance of Australia IPOs from 1976 to 1993. They examined 5 years of post-listing operating performance and confirmed that operating performance deteriorated over the first 4 years after listing. Interestingly they found that board composition is not associated with operating performance but there was some evidence to suggest that independent board leadership is associated with better operating performance.

In J. C. Y. How, Izan, and Monroe (1995) the authors explored the certification effect of independent external advisers, investigating accountants, the underwriter and its experts. They

reported only significant results highlighting a reputational effect of the underwriter on underpricing.

2.9 Hypothesis Development

2.9.1 Media Coverage

The effect of news on stories has on the decision to withdraw has not been analysed. Carey et al. (2016) state that by providing streamline information about the IPO, this may reduce the uncertainty around the IPO and thus increase the probability that the IPO will be successful. This notion is one which we wish to explore within this thesis. They note that their significance finding points to a possible mitigation of information asymmetry and adverse selection problem. Beatty and Ritter (1986) and Ritter and Welch (2002) note that information asymmetry between investors and the issuer make it difficult for investors to price new issues. This effect is most notable with retail investors who suffer from Rock's (1986) winners curse and thus as Carey (2016) argues, they may rely on the information contained within news articles. Therefore, if a firm experiences optimistic news coverage from the time it announces its IPO listing and before it is listed, it would be more likely that the uncertainty around the issue is reduced and thus be more likely to be fully subscribed.

As discussed, Tinic (1988) theorises that most potential investors lack the incentive to undertake their own thorough investigations of the IPO firm. Therefore, increased media coverage (e.g., proxied by the number of citations in the Financial Times and the New York Times in Baker and Nofsinger Baker (2002)) of the firm pre-IPO would also be associated with a reduction in information asymmetry, which should lead to more accurate pricing of the issue (Pollock & Rindova, 2003).

In the US, media coverage creates hype around an issue and thus lead to increased underpricing of Internet company IPOs DuCharme et al. (2001). The authors note an explanation for why the shareholders would accept a higher level of underpricing and not instead increase their reservation price in like of the positive media, this reason was noted as the need to leave a positive taste in investors mouths as the issuing firm had a high cash burn rate and therefore would need to return to capital markets soon. Without this mechanism, it becomes arguable that media coverage could have two effects; increased investors demand for the firm's stock, and increases the issuing firm's reservation price as the original shareholders want to maximise the proceeds they obtain from the IPO. This notion is supported by Liu, Sherman, and Zhang (2014),

who found that pre-IPO media coverage was negatively related to a firm's cost of capital by examining the firm's expected return one, two and three years after its IPO. This is consistent with the Merton's attention model that predicts that stock that receive more attention should have lower rates of return and thus higher valuations (Merton, 1987). Therefore, the media coverage must have led to an increase in demand for the firm's stock and an increase in the firm's listing price on the day of its IPO thus avoiding the effect that was observed by DuCharme et al. (2001). This is possible as the listing firm does not set the price of its share until the day before the official date of listing.

Gao and Ritter (2010) explored ways that issuers could shift out their demand curve in a SEO that were fully marketed. Therefore, we argue, in line with the findings by Boeh and Southam (2011), that news articles at the time of the company's IPO aid in the reduction of information asymmetry by facilitating increased disclosure and allow for greater information dissemination with the increased information in the media. With reduced information asymmetry investors should expect lower agency costs, and thus a positive impact on IPO success.

In Australia, where firms most commonly use the fixed price method, the issuing firm cannot change its offer price unless it withdraws its IPO. Therefore, media courage can only effect demand when the fixed price method is used, and therefore could lead to a greater likelihood of IPO completion. Carey (2016) also suggests that by providing streamlined information about IPOs public channels, news reports may reduce IPO uncertainty and increase the probability of the float being successful. We propose a way to explore phenomena in the Australian context by examining whether media coverage influences the probability of a firm completing its IPO. Therefore, the first hypothesis presented in this thesis is:

> ***Hypothesis 1***: News articles about a firm or its IPO at the time of its IPO announcement have a positive effect on IPO completion.

We note that informative news articles reducing information asymmetry but these informative articles could yield either negative informative news or positive informative news. Alternatively, as it has been found previously uninformative news articles do not reduce information asymmetry and therefore certainty about the IPO. It is arguable that this types of news coverage has any effect on demand, without a reduction in uncertainty the only potential

effect these articles has on demand is either none, or potentially increasing investor awareness about the issue, which may increase demand. Because of the complexity around this issue, we purpose that the overriding effect is that news articles increase demand and thus IPO completion.

2.9.2 Underwritten IPOs and the Risk of Undersubscription

For companies undertaking an IPOs a considerable risk of the involved in the issue is the risk that the IPO is undersubscribed; this means that the company fails to sell all the stock on issue. In many instances, this results in the company pulling out of the listing process as they cannot satisfy the minimum amount of funds they require, in the US a company has the option to reduce their offer price, but in Australia if the company is using the fixed price method, which 97% of our sample are, they must withdraw the IPO to do this.

The offer price for the company's stock is aimed to be set at the exact price at which all the stock to be issued can be sold to investors. The institutional bookbuilding method aids in this goal as institutional feedback ensures the price is set to a level that will ensure this goal is fulfilled, but this process is not common place and it remains the the price because fixed after the prospectus is lodge with ASIC and prior to any commitments to buy have been made. Within Australia, the size issues may impede the efficacy of this method as institutional investors are less motivated to undertake the required effect to come to their own determinations as to price. Thus, for companies that utilised the fixed pricing method, are at notable risk of having their issues undersubscribed. This risk exists for all companies undertaking an IPO and is the main reason companies opt to have their issue underwritten, where they make an agreement with an underwriter or a syndicate of underwriters to purchases all the shares available in the IPO and resell them to investors or purchase any remaining shares that fail to sell.

A company may choose to have the entire issue underwritten or a proportion thereof. If they choose to have a proportion underwritten, then the risk of undersubscription would still be present. This thesis examines the effect of an IPO being partially underwritten on the probability of withdrawal therefore formally the following hypothesis is presented:

> ***Hypothesis 2***: There is a positive effect on IPO completion likelihood for a firm choosing to have their IPO partially underwritten.

Chapter 3 – Methodology

3.1 Data Collection

3.1.1 Data Sample Selection

The sample consists of companies that between 2004 and 2014, either listed on the ASX or announced an intention to list on the ASX during but subsequently withdraw from the listing process prior to listing. Data was identified using the Connect4 database. Consistent with previous studies ((Boeh & Southam, 2011; Dunbar & Foerster, 2008)), we exclude all rights, equity and property trust and issues involving convertible instruments leaving 1169 listed companies and 172 withdrawn companies.

Prospectuses for the withdrawn set of companies were obtained from the Connect4 database, and historical financial information was extracted. Withdrawn companies with missing prospectuses and companies without historical balance sheet data contained within their prospectus were removed from the list of 172 withdrawn companies. We did not eliminate companies without historical income statement data because a number of firms that choose to IPO are firms that are 'pre-revenue' or do not have revenues for the year prior to the IPO. At this point, we were left with 137 companies within the withdrawn sample.

Historical data for the listed companies was extracted from Bloomberg with missing information hand collected from the prospectuses. A macro was constructed to identify the financial year immediately before the IPO announcement date for each company; this financial year was then integrated into a search function to draw financial statement data from Bloomberg. Balance sheet data was extracted from Bloomberg in a similar fashion, except instead of a financial year, the current year was used because we sought balance sheet data of interest from when the company was still private.

Amount sought from the IPO and the implied market capitalisation of the company when it firsts lists on the ASX for the withdrawn set of companies were drawn from the prospectuses combined with information from Connect4. A company's implied market capitalisation was calculated by taking the average of the minimum and maximum and shares outstanding multiplied by the offer price. If the offer price was a range, then the minimum number of shares outstanding was multiplied by the minimum offer price, and the maximum offer price was then multiplied by the maximum shares outstanding. The market capitalisation of firms that

completed their listing was calculated by multiplying shares outstanding at the time of the listing and the offer price; this information was obtained from Bloomberg.

Details of the company and the company's IPO were collected from a combination of the company prospectuses, Bloomberg and Connect4. These details were:

- the company's industry (BICS – Bloomberg Industry Classification);
- the year the company was created;
- IPO announcement date;
- offer price;
- minimum and maximum shares on issue through the IPO;
- the use of IPO proceeds;
- whether the IPO was underwritten partially or fully; and
- whether the withdrawn companies were involved in any M&A activity in the 12 months after withdrawing their IPO.

Company name changes present a challenge in any automated data collection processes; these were handled on a case by case basis. The process involved identify a name change by search the company name on delisted.com.au. At this point, an original company name could be identified, and this was then researched within the databases. This was especially relevant for the collection of media stories mentioned within Factiva, detailed below.

Companies with missing data were identified, and this data was attempted to be located by re-executing searches with updated company names and if this failed the company was removed from the dataset. Missing data also related to missing company prospectuses, if a withdrawn company's prospectus could not be located this company was removed from the dataset. Finally, companies with dual listings were also removed. After this process was complete, we had 134 withdrawn companies and 729 listed companies remaining.

3.1.2 Data Collection for the News Stories

A search for each company within the dataset was conducted on Factiva. The period of interested was artificially constructed to be 30 days prior to the IPO and 180 days thereafter, the company name was searched and the number of search results recorded, duplicates were avoided by an option available on the search page. This continuous variable was then converted into dummy variables representing varying degrees of media coverage. It is noted that the search window was too large and should have been two weeks, this is because the IPO listing process

usually takes 3 to 4 weeks on average, but some IPOs are listed after two weeks. Thus, if we had reduced the search window down to 2 weeks after the IPO announcement date, we would have avoided including news articles after the company had already listed. It is noted that this factor does undermine the results and therefore was the basis for the motivation to only consider the dummy variable representing any news articles vs. no news articles.

3.2 Testing the First Hypothesis – Media Coverage

Withdrawal is modelled as a binary outcome using the PROBIT routine in STATA. We also calculated the marginal effects defined as:

$$\phi(\beta x)\beta,$$

Where: $\phi()$ is the standard normal probability density function

$$\left(\left[\frac{1}{\sqrt{2\pi}}\right]e^{-\frac{1}{2}X^2}\right);$$

x is the mean value of the explanatory variable,

and β is the coefficient estimate.

Therefore, the marginal effects are show as the change in the probability of withdrawal give a one-unit change in the covariate.

3.3 Testing the Second Hypothesis – Partially Underwritten

In testing the second hypothesis, we are interested in estimating the effect of a firm having their IPO issue partially underwritten on the probability of a company having to withdraw its IPO.

3.3.1 Study Design: Observational Study vs. Randomised Experiment

In evaluating the effect of the choice to have an issue partially underwritten in hypothesis two, an ideal experimental design would be to take advantage of Rubin's Casual Model and observed both possible outcomes for each firm undertaking an IPO (Rubin, 1974). In this design, we would observe withdrawal probability (Y) when the firm has their IPO partially underwritten (Y_1), and when the same firm when its IPO is not underwritten (Y_0). We would make each observation of Y under the same conditions so that the only difference is whether the firm received the treatment. If this was possible, we could take the average of the differences between

Y_1 and Y_0 for each firm within our dataset and this would give us the average impact of the treatment on the probability of withdrawal (Rubin, 1974).

Because the firms cannot be observed having both the treatment and non-treatment we must obtain some estimate of what the probability of the firm withdrawing its IPO had it not received the treatment, this is known as the counterfactual. If we could undertake a random experiment the comparison group serves as a proxy for this counterfactual, because the treatment and non-treatment groups vary only randomly on observed and unobserved covariates, therefore the casual effect of the treatment could be calculated by comparing the outcomes between these groups (Rosenbaum & Rubin, 1983; Rubin, 1974)

As this is not possible, we must utilise observational data consisting of companies having experienced the treatment and those who have not to serve as a credible estimate of the counterfactual. But, if we were to make a direct comparison this could be misleading as the treatment and non-treatment groups may differ systematically (Rosenbaum & Rubin, 1983).

3.3.2 Endogeneity: Selection Bias

An observational study differs from an experiment in that the random assignment of treatments to units is absent. The absence of this randomisation makes it virtually impossible to be convinced that an estimation of a treatment effect is unbiased, this is because other variables that affect the depend variable besides the treatment may be differently distributed across treatment groups. Thus, the treatment effect estimation would be confounded by these variables (Cochran & Rubin, 1973). The lack of random assignment of the treatment in the observational data is a result of the treatment being a decision, made in consideration of varying factors that also are likely to influence the outcome that we are trying to assess.

There are several matching techniques that allows for the creation of a counterfactual group in observational studies. This created group mimics a random assignment by balancing the distributions of the covariates across treatment and non-treatment groups, thus the only difference remaining is the treatment assignment. The limitation of this technique is that it only balances covariates that are observable and identified as confounding variables, in other words, the assumption of matching is that the unobserved private information is irrelevant (Kai & Prabhala, 2007). If these unobserved variables that affect who is receives the treatment are independent of unobserved variables that affect the out-come, then the endogeneity problem does not exist.

3.3.3 Planning the Observational Study To Deal with Select Bias (endogeneity)

The first step in dealing with the presence endogeneity result from selection bias, was to first identify which were the major confounding variables that were likely to impact on the treatment effect estimation. This step is expounded in section 4.1.

The second step was to then decide on an appropriate technique to deal with the bias that would otherwise be present. One principal strategy is to utilise a matching technique which results in the distributions of the confounding variables to be similar in some respects across the treatment and non-treatment groups (Cochran & Rubin, 1973). This technique is a common procedure used to analyse a specific treatment (i.e. an event or certain factor of interest) on a company is to pair each company in the sample with a firm that has not experienced the treatment but are similar in all other aspects. The behaviour or outcome of interest within the sample group is then compared to the reference group (Chan, Lakonishok, & Swaminathan, 2007).

Matching methods utilise different: distance measures, (either propensity scores or Mahalanobis distances), matching algorithms (either greedy or optimal), and rules for comparison group member selection. The key differences between propensity scores and Mahalanobis distances is the weighting of the covariates. Propensity scores weight covariates by how well they predict group membership whereas Mahalanobis distance equally weight all covariates, taking into consideration variance and covariances as described above (Jacovidis, 2017).

I utilised the nearest neighbour matching algorithm which was developed by Abadie, Drukker, Herr, and Imbens (2004). This process uses Mahalanobis distances. Mahalanobis distance matching is not a propensity score technique, this technique was developed prior to propensity score matching (Cochran & Rubin, 1973).

3.3.4 Methodological Details and Formulas

3.3.4.1 Overview of Mahalanobis Distance Matching

The first step in utilising this technique is to calculate Mahalanobis distances this formula is presented below in the Equation 0 below (Guo & Fraser, 2015):

$$MD(i,j) = (\boldsymbol{u} - \boldsymbol{v})^T \boldsymbol{C}^{-1} (\boldsymbol{u} - \boldsymbol{v}) \quad \textbf{(0)}$$

Where: the distance $MD(i,j)$ is the Mahalanobis distance between the treatment group member i and the non-treatment group member j, $\boldsymbol{u}$ and $\boldsymbol{v}$ are vectors of covariates for treatment group

member i and non-treatment group member j, respectively, and $\boldsymbol{C}$ is the sample covariance matrix from the full comparison group reservoir. (Jacovidis, 2017)

Mahalanobis distances is a multivariate distance measure that uses the matrix of distances as well as the variance co-variance matrix to calculate the distance between the points. This process removes the covariance by treating each eigenvectors as a new axis, and then shrinks this new axis by $\sqrt{\lambda_i}$, then calculate Euclidean distance between the rescaled points to get the multivariate distance measure (Mahalanobis, 1936)

Only two treatment levels are permitted when using this method therefore we have split into them a control group with $t = 0$ and a treatment group with $t = 1$. There was the opportunity to split the number of news articles into numerous dummy variables, but it was decided that this would be only done at one level (not underwritten, either partially or fully) and then the treatment groups (underwritten partially). By coding the data this way, we can isolate the effect of each treatment as compared to companies without any treatment level.

Matching estimators are based on the potential-outcome model, in which each company has a well-defined outcome for each treatment level. In the binary-treatment potential-outcome model, $y1$ is the potential outcome obtained by an individual I if given the treatment-level 0 (StataCorp, 2015). The Average Treatment Effect ('ATE') represents the treatment effect at a population level; when selecting ATE within NNM each company within the dataset (t = 1 & t = 0) has its counterfactual outcome imputed. The Average Treatment Effect on the Treated ('ATET') represents the treatment effect for those within the dataset who received the treatment; when selecting ATET within NNM, each company with t = 1 has its counterfactual outcome imputed.

The ATE can, therefore, be stated as:

$$\tau 1 = E(y1 - y0) \quad \textbf{(1)}$$

and the ATET can be stated as:

$$\delta 1 = E(y1 - y0 \mid t = 1) \quad \textbf{(2)}$$

For ATE NNM uses an average of the outcomes for companies that are most similar expect for the treatment level, to the unobserved potential outcome. The ATE options determines the effect at the population level but matching not only the treated companies but also the

untreated companies. ATET NNM again uses the average of the outcome companies that are most similar expect that it only predicts the unobserved outcomes for the treated group. NNM uses the covariates $[X_1, X_2, \dots, X_p]$ to find the most similar company that has the other treatment level (StataCorp, 2015). NNM within Stata is based on the results in in Abadie and Imbens (2006), (2011) and a previous implementation in Abadie et al. (2004).

To use NNM, some assumptions must be made; their descriptions are sourced from the Stata guides (StataCorp, 2015).

Firstly, independent, and identically distributed (i.i.d.) samples assumption, stipulates that the outcome and treatment status of one company is unrelated to the outcome and treatment status of all the other companies in the population.

Secondly, conditional-independence (CI) assumption means that after we control for all observable covariates, the potential outcomes (counterfactual outcomes) are independent of treatment assignment. Unless we specifically control for a covariate that may be related to both the treatment assignment and outcome our model would violate this assumption. If there are any covariates that should be controlled for which are omitted, then we would be overstating the impact of the treatment on withdrawal likelihood.

Finally, the overlap assumption states that each company has a positive probability of receiving the treatment. This means that we can match the treated company with similar nontreated subjects and vice-versa. If this assumption is not meet, then we would not be accurately assessing the impact of the treatment.

3.3.4.2 Process

Below sets out the details of the process used to implement the NNM technique. It begins with the first steps used in this process, namely, the identification of confounding factors that if not identified and controlled for would render any findings biased. This section then continues with the second step in the implementation of the NNM and outlines the specifics of this process with the Stata software as well as the modifications to some of the confounding factors to ensure the successful implementation of the NNM technique.

3.3.5.2.1 Outcome Probit Model

Before the NNM technique can be executed the ‘outcome model’ needs to be properly specified. The outcome model is a probit or logit regression of the outcome of interest dependent on several variables that are significant at a chosen level of significance. The independent

variables are included in the regression so that once the matching is conditional upon these variables, the treatment effect has been isolated.

The baseline attributes of the company and the company's IPO serve as confounding variables, in that they are related both to the outcome (withdrawal), and to the treatment assignment. There may exist other unobserved confounding factors that could influence the outcome; this is a limitation of the current technique. The variables that were tested for significance were: industry dummies; year of IPO dummies; use of proceeds; numerous profitability measures; numerous measure of company size include the implied/realised market capitalization of the company at the time of listing and logarithmic transformations of this and other measures; dummy variable representing if the company had revenues at the time of the IPO; age of the company; Debt to Equity (D/E) ratio and a dummy representing whether the company had a positive D/E ratio; amount sought through the IPO; amount sought ratio; retention ratio; leverage; Tobin's Q (market value divided by book value of equity); the number of articles within news media around the time of the IPO announcement; dummies representing varying levels of articles within news media; and finally whether the IPO was underwritten partially or underwritten fully or not underwritten. The logic for include the treatments – underwritten fully/partially and news headlines, was to see if they should be incorporated into the outcome model when testing the alternative treatments.

The outcome regression model forms the foundation of the outcome models used in each nearest neighbour matching estimate take the form:

$$\Pr(Withdrawn = 1 \mid X) = \Phi(X^T\beta) \quad \textbf{(3)}$$

Where:

Pr denotes the probability,

Φ is the Cumulative Distribution Function (CDF) of the standard normal distribution, and

X is the vector of covariates which influence the outcome Withdrawn

And is expressed as:

$$Withdrawn = \beta_1(NegYR) + \beta_2(R\&D) + \beta_3\left(Positive\frac{D}{E}Ratio\right) + \beta_4(No\ New\ Articles) + \beta_5(Revenues\ Dummy) + \beta_6(AssetTurnoverRatio) + \beta_7(\log(Market\ Capitalisation))) + \beta_7(Age) \quad \textbf{(4)}$$

Where:

$$Withdrawn = \begin{cases} 1, & IPO\ Withdrawn \\ 0, & IPO\ Completed \end{cases}$$

Asset Turnover Ratio is used as a proxy for the company's profitability; Research and Development is a dummy variable signifying that the company's stated use of proceeds included this purpose; Revenues dummy represents if a company has revenue for the last financial year prior to the IPO announcement date; Bad year dummy is an artificially constructed dummy used as a proxy for dealing with the potential impact of hot or cold markets. Specifically it signifies that the company's IPO announcement date was in a year were withdrawal of IPOs for that year were above the average withdrawal rate for the entire period; No news articles is a dummy representing that the company has no articles within news media around the time of the IPO announcement; Positive debt-to-equity ratio is a dummy representing that the company has a D/E ratio above zero; age of the company is a continuous variable in years; and log of total assets is a proxy for company size.

Stata automatically tests for collinearity while running the regressions. No terms were found to be collinear. This probit model indicates which variables are significant on withdrawal; this model is altered depending on the specific research question being tested, further discussion on the way and how it is altered is discussed below.

3.3.5.2.2 Nearest Neighbour Matching

After the satisfactory outcome model was determined it was integrated into the teffect nnmatch function with Stata along with the treatment dummy. The output of teffects nnmatch should be disregarded at first as a test of the balancing of the covariates between the treatment, and the non-treatment group must be conducted first.

The balancing testing for teffect nnmatch comprises of ensuring that the difference of each covariate within the outcome model is minimised as close to zero as possible (i.e. there is no difference). Furthermore, the ratio of variance of the covariate between treatment and non-treatment group should be as close to 1 as possible.

If a covariate fails to balance several strategies were adopted to deal with this. Each continuous variable posed some issues in terms of balancing. Asset Turnover Ratio ('ATR') for example failed balance throughout each test. A histogram of this variable showed that the data was skewed. After reviewing the data to check for errors the winsor command which winsorises

the variable was utilised to deal with outliers. Winsorization sets all outliers above a certain percentile to a specified percentile. This technique deals with balancing issues, and controls for outliers driving the treatment effect results.

After the winsorization was conducted teffects nnmatch was rerun with the transformed ATR variable and the balancing test rerun. This process involved several iterative versions to before satisfactory balancing was achieved.

The foundational outcome model is altered to include MAWithdraw as it could not be included in the probit estimate in the foundational model as it '0 predicts success perfectly'. Its inclusion in the outcome model used while executing the nearest-neighbour matching is to control for this covariates impact on the ATE estimate. It is unclear why it does not cause errors; it is believed that this is because nnmatch does not compute the probit or logit outcome mode.

3.4 Identification of Confounding Covariates

This section reports the result of the probit modelling that was conducted iteratively to identify which covariates had a significant effect on withdrawal probability.

The predicted probability of withdrawal of an IPO for a company is:

$$\Phi\,(0.70\,(Y2008) + 0.52\,(Y2011) + 1.00\,(Y2012) - 2.48\,(R\&D) - 0.72\,\left(Positive\,\frac{D}{E}\,Ratio\right) - 1.29\,(News\ Coverage) - 0.79\,(Underwritten\ Partially) - 1.15\,(Underwritten\ Fully) + 0.95\,(Revenues\ Dummy) - 0.70(Asset\ Turnover\ Ratio) - 0.22\,(\log(Market\ Cap)) - 0.02\,(Age) + 2.21) \quad \textbf{(5)}$$

Where:

Φ is the Cumulative Distribution Function (CDF) of the standard normal distribution.

The results of this regression are provided in Table 1. It is noted that Log of Market Cap is not significant at an α of 10%; regardless, it is desirable to utilise this variable as a proxy for the sise of the company. The Log of Total Assets which is also a proxy for company size is significant at 5%, but market cap is preferred as total assets could not be balanced.

While these variables have been included in the probit model M&A activity dummy which represents whether a withdrawn company was involved in M&A activity in the 6 months after its IPO withdrawal is included in the estimation of the treatment effect. The logic behind its

inclusion is that most of the post withdrawal M&A activity resulted in higher valuations than what would have been realised had the company completed the IPO listing.

Table 2 - Probit regression results

Probit regression			Number of obs		=	863
			LR chi2(8)		=	421.64
			Prob > chi2		=	0.0000
Log likelihood = -161.77912			Pseudo R2		=	0.5658
Withdrawn	Coef.	Std. Err.	Z	P>|z|	[95% Conf.	Interval]
Y2008	0.70	0.31	2.28	0.02	0.10	1.31
Y2011	0.52	0.24	2.16	0.03	0.05	0.99
Y2012	1.00	0.39	2.57	0.01	0.24	1.77
RD	-2.48	0.30	-8.26	0.00	-3.07	-1.89
PosDE	-0.72	0.20	-3.53	0.00	-1.11	-0.32
NewsCoverage	-1.29	0.19	-6.79	0.00	-1.66	-0.92
UnderwrittenPartially	-0.79	0.29	-2.68	0.01	-1.36	-0.21
UnderwrittenFully	-1.15	0.22	-5.22	0.00	-1.59	-0.72
RevYN	0.95	0.19	4.92	0.00	0.57	1.33
AssetTurnoverRatio	-0.70	0.23	-2.96	0.00	-1.16	-0.24
lnMarketCap	-0.22	0.15	-1.47	0.14	-0.51	0.07
Age	-0.02	0.01	-2.35	0.02	-0.03	0.00
_cons	2.21	1.10	2.01	0.04	0.06	4.37

Each of the continuous variables required a degree of manipulation to satisfy the balancing requirement when implementing the NNM technique. The NNM test examining the effect of an IPO being partially underwritten required different manipulation to the continuous variables when compared to the news articles analysis. This is because each test is based on either a different subset of the dataset or the entire dataset but with the composition of the treatment and non-treatment groups changes depending on the treatment being tested.

Depending on the treatment variable being tested it and its associated variables are removed from the outcome model. During the news coverage testing, it is removed as it becomes the treatment variable. During the underwritten partially testing, both it and underwritten fully variables are removed; the treatment variable is underwritten partially, but all companies that are underwritten fully are removed from the dataset.

3.5 Data Overview

This section of the thesis provides an overview of the data used in the analysis. Each section provides details on the covariates that are utilised within NNM for each test. Details of their manipulation and justification for this manipulation is also included.

3.5.1 Timing of the IPOs

Table 3 shows the number of firms listed for the year, number withdrawn, proportions of firms that withdrew each year when compared to the number of listed for that year, and finally the proportion of listed firms and withdrawn firms as compared to the total number of each group overall. This table gives the impression that the timing of an IPO offering impacts on the likelihood that a firm might withdraw. Notably, 2008 shows that the proportion of withdrawn firms for that year to be 45.16 percent as well as 2012 which has 43.33 percent.

Table 3 - Number of filings per year

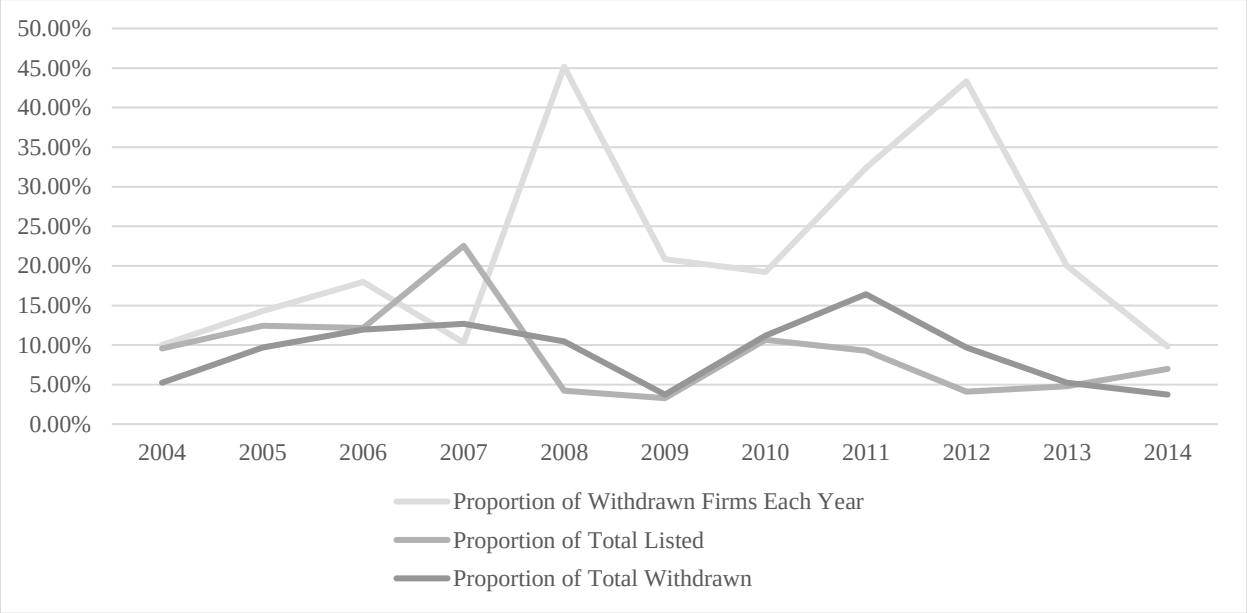
Year	Number of Listed Companies	Number of Withdrawn Companies	Proportion of Withdrawn Firms (%)	Proportion of Total Listed (%)	Proportion of Total Withdrawn (%)
2004	70	7	10.00%	9.56%	5.22%
2005	91	13	14.29%	12.43%	9.70%
2006	89	16	17.98%	12.16%	11.94%
2007	165	17	10.30%	22.54%	12.69%
2008	31	14	45.16%	4.23%	10.45%
2009	24	5	20.83%	3.28%	3.73%
2010	78	15	19.23%	10.66%	11.19%
2011	68	22	32.35%	9.29%	16.42%
2012	30	13	43.33%	4.10%	9.70%
2013	35	7	20.00%	4.78%	5.22%
2014	51	5	9.80%	6.97%	3.73%
TOTAL	732	134	18.31%	84.49%	15.51%

During the search for significant confounding factors influencing withdraw, yearly dummies surprisingly had no significant effect. Noting that timing, namely, the hot and cold markets is an important issue highlighted within IPO literature, this issue is suspected to be a notable confounding factor on withdrawal likelihood.

Figure 1 shows that 2008 and 2012 most evidently impact on withdrawal of an IPO, closely followed by 2011. These three years can also be seen to have the widest gap between Proportion of Total Withdrawn and Proportion of Listed (with Proportion of Withdrawn above Proportion Listed), these years are suspected to have a positive effect on withdrawal likelihood.

A gap can also be noticed with 2007, but this gap is created by a large proportion of Listed Firms as compared to Withdrawn Firms for that year; potentially this year might have a positive effect on completion of IPOs.

Figure 1 – Proportion of IPOs Withdrawn or Listed each year from 2004 to 2014



Each of these year dummies, when tested individually, are found to have a significant effect on withdrawal. When all are tested together, only 2008, 2011 and 2012 remain significant at α of 5%. To help with balancing during the treatment testing, a dummy variable that equalled the sum-total of all these dummies was constructed.

Where:

$$NegYR = \begin{cases} 1, & 2008\ or\ 2011\ or\ 2012 \\ 0, & Any\ other\ year \end{cases}$$

This variable is used in replacement of each of the yearly dummy variables above. There may be some issues relating to loss of data due to this truncation of three dummies into one, but this is accepted as the desirability for balancing supersedes this concern.

3.5.2 Size of the Firms – Implied Market Capitalisation

Because there are a small number of very large firms within our dataset, it was appropriate to take the log of Market Capitalisation to control for these outliers. In comparing Figures 2 (raw data) to Figure 3 (log of this data), we can see there is a vast improvement in terms of balancing

in the NNM testing. However, the Log of Market Capitalisation was also winsorised by 5% to achieve satisfactory balancing.

Figure 2 – Histogram of Market Capitalisation of all Firms

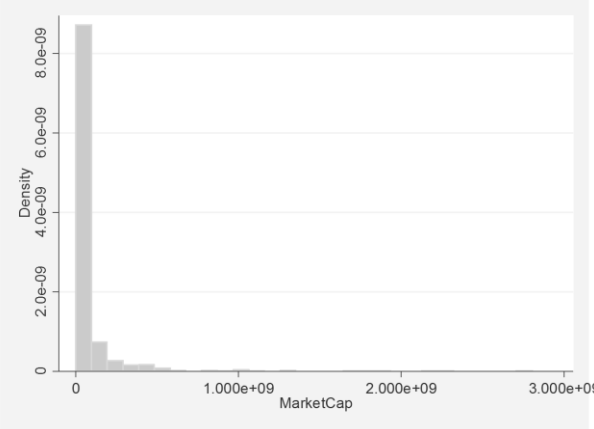
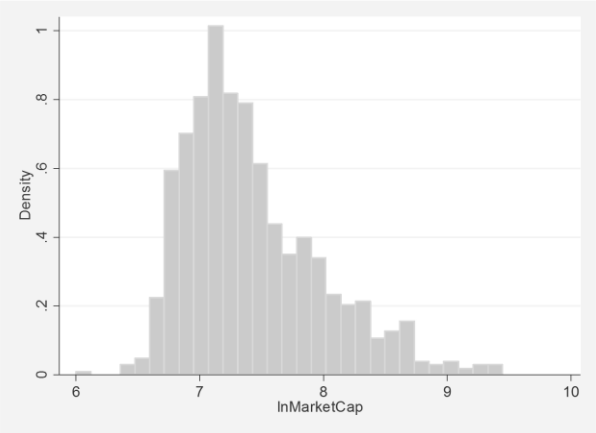


Figure 3 – Histogram of Log of Market Capitalisation of each Firm



3.5.3 Profitability of the Firm – Asset Turnover Ratio

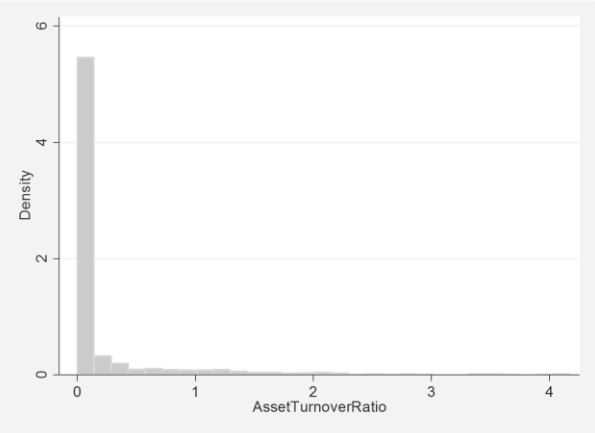
The Asset Turnover Ratio for a company was calculated by:

$$ATR = \frac{Revenues}{Total\ Assets}$$

A potential problem with this confounding factor is the lack of symmetry. When Revenues are greater than Total Assets, the ratio can take any value greater than one. If the inverse is true, then the ratio can only be within the range of zero to one. Taking the log of the ratio solves this problem and restores the potential for symmetry Dallal (2012).

Figure 4 – Histogram of Asset Turnover Ratios for all Firms

Figure 5 – Histogram of Log of Asset Turnover Ratio of each Firm



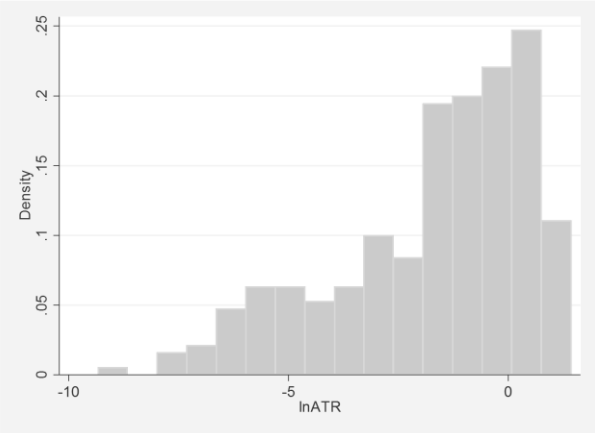


Figure 4 & 5: Each of the above graphs is a histogram showing the distributions of each variable. Both variables when tested individually within the probit modelling were found to be significant. When integrated into the complete model the log of ATR caused collinearity problems. Furthermore, it failed to adequately deal with outliers which can be seen in Figure 6 below.

Figure 6 – Histogram of Asset Turnover Ratios for all Firms

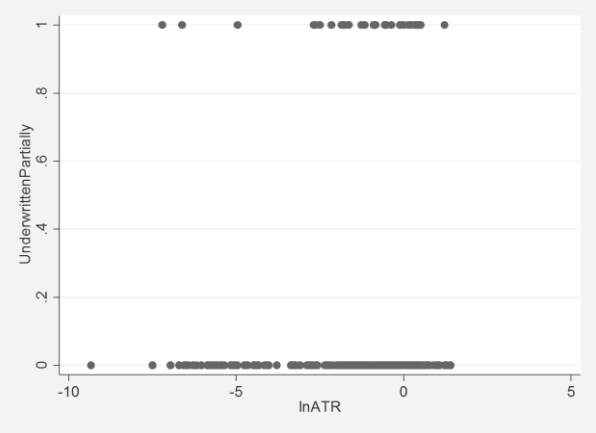


Figure 6: It is evident that the untreated group of companies would fail to have appropriate corresponding matches.

The collinearity problem precludes this transformation from being of any assistance. The next step was to winsorise Asset Turnover Ratio by 12%.

Figure 7 – Overlap Assumption: Underwritten Partially Dummy vs Asset Turnover Ratio

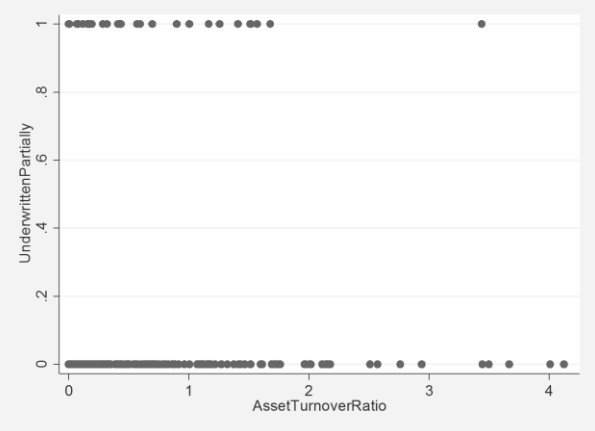


Figure 8 – Overlap Assumption: Underwritten Partially Dummy vs Asset Turnover Ratio (Winsorised)

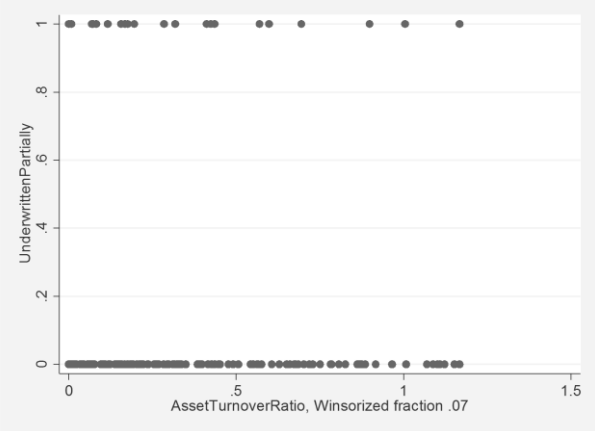


Figure 7: This graph shows that companies with their IPOs partially underwritten with higher Asset Turnover Ratio do not have corresponding companies with non-underwritten IPOs. This is where winsorisation of the data is implemented to deal with these outliers and therefore ensure that the overlap assumption is sufficiently satisfied.

Figure 8: This graph is reproduced with Asset Turnover Ratio being replaced by Asset Turnover Ratio which is the same covariate but winsorised by 7%. Here it is evident that the treated group have corresponding untreated matches, but the reverse cannot be said for all untreated companies. Thus, when computing ATE where each company has its counterfactual imputed, we may have issues.

3.5.4 Leverage – Debt to Equity Ratio

Figure 9 – Debt to Equity Ratios for Withdrawn companies vs. Listed companies

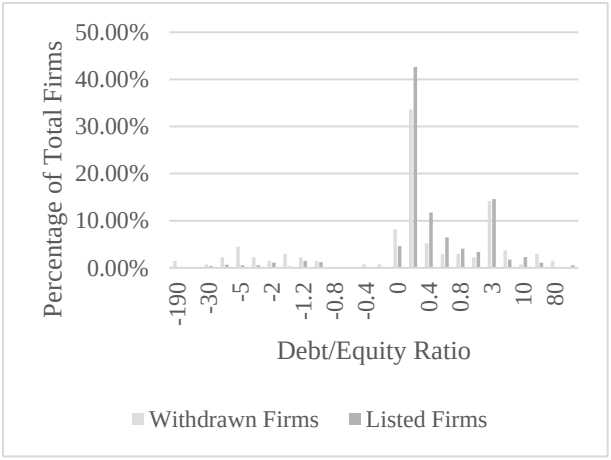


Figure 10 – Percentage difference of the number of Firms between Withdrawn Firms and Listed Firms with varying D/E Ratios

Figure 9: This graph shows the wide distribution of debt to equity ratios for all companies, of note is that Listed Firms as a group appear to have a higher degree of D/E ratios above 0.2 onwards.

Figure 10: is further evidence of this point. During probit model testing, D/E ratio did not have any significance in predicting the probability of withdrawal, however, noting the above, a dummy variable was constructed to include this information.

Where:

$$PosDE = \begin{cases} 1, & \frac{D}{E} Ratio\ higher\ than\ 0 \\ 0, & \frac{D}{E} Ratio\ of\ 0\ or\ higher \end{cases}$$

This dummy variable proved to be significant and allow for satisfactory balancing within the treatment effect testing.

3.5.5 Maturity of the Firm – Age

This variable had several severe outliers which can be seen below in figure 11. Winsorisation was implemented at varying levels to condense the data.

Figure 11 – Histogram of Age of all Firms

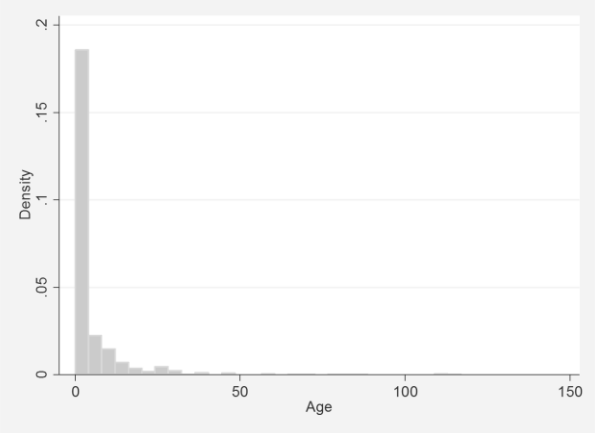


Figure 12 – Histogram of Age all Firm (winsorised 12%)

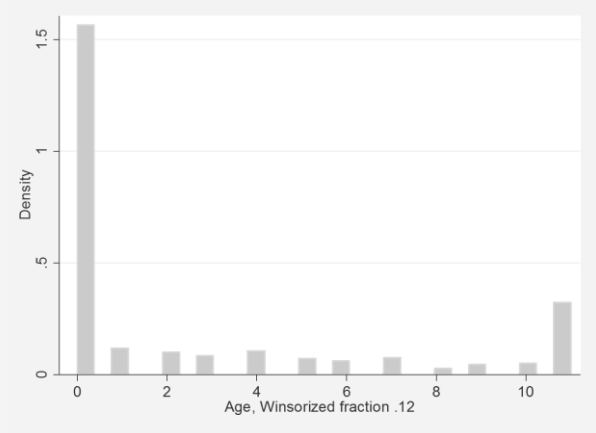


Figure 11 & 12: The first figure shows raw data where a small number of older firms can be seen followed by the next figure where the winsorised data which recategorised firms older than 11 years old as 11 years old can be seen.

3.5.6 Use of IPO proceeds – Research & Design

Table 4 - Number of companies: Use of proceeds – R&D vs. Withdrawn

	Withdrawn		
R&D	0	1	Total
0	246	132	378
1	483	2	485
Total	729	134	863

Note: Immediately it is notable that companies who state use of proceeds as R&D, they much less likely to withdraw.

3.5.7 Media Coverage of the Firm's IPO

Various dummy variables were constructed representing varying ranges of news articles relating to each company's IPO. Only the dummy representing any number new articles vs. zero was found to be significant. This dummy variable was included as a confounding factor in the first question within this thesis and becomes the treatment variable within the second question.

Table 5 - Number of companies: News Coverage vs. Withdrawn

	Withdrawn		
NewsCoverage	0	1	Total
0	298	121	419
1	431	13	444
Total	729	134	863

Where:

$$NewsCoverage = \begin{cases} 1, & Any\ number\ of\ news\ articles\ about\ the\ IPO \\ 0, & Zero\ news\ articles\ about\ the\ IPO \end{cases}$$

Note: Immediately it is notable that companies with some degree of news coverage are much less likely to withdraw.

3.5.8 Underwritten IPOs

Two dummy variables representing whether the IPO was either underwritten partially or fully. Both variables are controlled for within the News Coverage testing. Within the Underwritten Partially effect testing a new variable was constructed that excluded all Underwritten Fully companies from the dataset; this was done, so the subset of only companies that were underwritten partially or not underwritten at all was identified.

Table 6 - Number of companies: Underwritten Fully vs. Withdrawn

	Withdrawn		
UnderwrittenFully	0	1	Total
0	495	122	617
1	234	12	444
Total	729	134	863

Table 7 - Number of companies: Underwritten Partially vs. Withdrawn

	Withdrawn		
UnderwrittenPartially	0	1	Total
0	647	126	419
1	82	8	444
Total	729	134	863

Where:

$$UnderwrittenFully = \begin{cases} 1, & Company's\ IPO\ was\ fully\ underwritten \\ 0, & Company's\ IPO\ was\ not\ fully\ underwritten \end{cases}$$

$$UnderwrittenPartially = \begin{cases} 1, & Company's\ IPO\ was\ partially\ underwritten \\ 0, & Company's\ IPO\ was\ not\ partially\ underwritten \end{cases}$$

Note: Each of the dummies when set to 0, represents both companies that were not underwritten and underwritten to the other level.

Chapter 4 – Results

4.1 Hypothesis 1 Results - News Coverage

Table 14 presents the results of the Withdrawal model with the estimated coefficients, marginal effects, and chi-squared statistics. The goodness of fit for the model is high, with a pseudo R^2 56.41%. VIFs were calculated showing a maximum VIF of 1.62 suggesting multicollinearity is not an issue. The covariate for the log Market Capitalisation is not significant, but every remaining covariate is significant.

Hypothesis 1 suggested that News Coverage would be negatively related to IPO withdrawal. The negative relationship between News Coverage and withdrawal provides support for H1, which is consistent with our expectations.

Table 8 – Probit Regression – Withdrawal Model

Withdrawn	**β**	**dy/dx**	**S.E.**	**z**		**[95% Conf. Interval]**	
Intercept	2.1791		1.0839	2.0100		0.0546	4.3035
Negative Year	0.6597	0.0699	0.1869	3.5300	***	0.2935	1.0260
Positive DE Ratio	-0.7273	-0.0770	0.2030	-3.5800	***	-1.1253	-0.3294
Use of proceeds – R&D	-2.5080	-0.2656	0.3041	-8.2500	***	-3.1039	-1.9120
Revenues Dummy	0.9588	0.1015	0.1940	4.9400	***	0.5786	1.3390
Fully Underwritten Dummy	-1.1459	-0.1214	0.2212	-5.1800	***	-1.5794	-0.7123
Partially Underwritten Dummy	-0.7772	-0.0823	0.2926	-2.6600	**	-1.3507	-0.2036
Age	-0.0160	-0.0017	0.0069	-2.3200	*	-0.0295	-0.0025
Asset Turnover Ratio	-0.7049	-0.0747	0.2357	-2.9900	**	-1.1669	-0.2428
Market Capitalisation (ln)	-0.2130	-0.0226	0.1469	-1.4500		-0.5010	0.0750
News Coverage Dummy	-1.3093	-0.1387	0.1902	-6.8800	***	-1.6821	-0.9366
Pseudo R^2				56.41%			
Model change LR Test				420.33***			
Pearson chi2				987.15***			

Note: † $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

4.2 Hypothesis 2 Results - Average Treatment Effect - Partially Underwritten IPOs

In testing, companies with IPOs that were fully underwritten were removed from the dataset. This is done to isolate the treatment effect; failure to remove fully underwritten IPOs would result in comparing the effect of a company having its IPO partially underwritten as compared to not underwritten at all or underwritten fully.

Therefore, the underwritten partially dummy was varied removing the 0 for all companies that were underwritten fully; therefore n = 617, with the treatment group n = 90, and untreated group n = 527.

4.2.1.1 Descriptive Statistics – Partially Underwritten IPOs vs. IPOs not Underwritten

Table 9 - Descriptive Statistics: Partially Underwritten IPOs vs. IPOs not Underwritten

			Partially Underwritten IPOs (n = 90)		IPOs not Underwritten (n = 527)	
Variable	Min	Max	Mean	Std. Dev.	Mean	Std. Dev.
Withdrawn	0	1	0.09	0.29	0.22	0.41
NegYR	0	1	0.22	0.42	0.22	0.41
RD	0	1	0.58	0.50	0.54	0.50
PosDE	0	1	0.89	0.32	0.84	0.37
NewsCoverage	0	1	0.57	0.50	0.50	0.50
MAWithdraw	0	1	0.03	0.18	0.04	0.20
RevYN	0	1	0.22	0.47	0.35	0.48
Agew12	0	11	3.16	4.08	2.54	3.99
ATRw7	0.00	1.17	0.18	0.37	0.16	0.35
lnMarketCa~5	6.73	8.55	7.44	0.56	7.42	0.50

Where: (Yes = 1), (No = 0).
NegYr = IPO announcement date within the year 2008 or 2011 or 2012
RD = Use of proceeds - Research and Development
PosDE = Company had (did not have) a positive D/E Ratio
NewsCoverage = Company had (did not have) news headlines during the period 30 days prior to the IPO announcement date and 150 after this date
MAWithdraw = M&A Activity within 12 months post withdrawal
RevYN = Company has revenues for the financial year ending preceding the IPO announcement date
Agew12 = Age of the company (winsorised)
ATRw11 = AssetTurnoverRatio (winsorised)
lnMarketCapw5 = Log of Market Capitalisation (winsorised)

The descriptive statistic table gives the means and standard deviation of the confounding factors for the treatment and non-treatment group. As these are different the matching technique deals with this disparity between the groups. Thus this highlights the importance of testing for

balancing of this confounding factors to ensure the technique has achieved what it is designed for.

4.2.1.2 Outcome model – Partially Underwritten IPOs

A summary of the winzorisation is as follow: Asset Turnover Ratio winsorised by 7%. Age winsored by 12% which changed the age of firms older than 11 years to 11 years old. The log of Market Capitalisation winsorised by 5%. The high level of winsorisation of these covariates became necessary due to the decrease in the number of observations within the treatment group (n = 90).

4.2.1.3 Balancing of the covariates between treatment and non-treatment groups – Partially Underwritten IPOs

Before the results are examined the balances of the covariate is examined to determine whether satisfactory balancing has been achieved. As mentioned within the process section of this thesis, balancing is achieved with a visual examination of the balancing table. Balancing is achieved by reducing Standardised differences to as close to zero; with a variance ratio of as close to 1. No formal testing was conducted.

Table 10 - Covariate balance summary: Underwritten Partially ATE

	Standardised differences		Variance ratio	
	Raw	Matched	Raw	Matched
NegYR*	0.01	-0.05***	1.02	0.93**
RD	0.08	-0.02	0.99	1.00
PosDE	0.15	0.06***	0.73	0.90**
NewsCoverage	0.12	-0.01	0.99	1.00
MAWithdraw	-0.03	0.00	0.85	1.00
RevYN	-0.06	-0.02	0.97	0.98
Agew12	0.15	0.06***	1.05	0.98
ATRw7	0.04	-0.01	1.11	0.94**
lnMarketCapw5	0.05	-0.05***	1.26	1.01

Note:
* Matching has reduced the balance of this covariate, noted by examining Raw (balance before matching) and Matched (balance after matching)
** Variance ratios should be closer to one
*** Standardised differences should be close to zero

Countless iterations of the model were undertaken to improve balancing, in the end, this was the best model. It is noted that some papers within the *Journal of Financial Economics* have not examined the effectiveness of propensity score matching by testing the difference in the

means between the sample and control groups' covariates, see: Tucker (2010) who identified the following papers: Hillion and Vermaelen (2004); P. M. Lee and Wahal (2004); Hale and Santos (2009); Faulkender and Yang (2010); Officer, Ozbas, and Sensory (2010).

Noting the imperfect balancing of covariates, the results of this test are presented in table 13.

4.2.1.4 Average Treatment Effect Results – Partially Underwritten IPOs

Table 11 - Average Treatment Effect Results: Partially Underwritten IPOs

Treatment-effects estimation				Number of obs	=	613
Estimator	: nearest-neighbor matching			Matches: requested	=	1
Outcome model	: matching			min	=	1
Distance metric	: Mahalanobis			max	=	7
Withdrawn	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATE						
UnderwrittenPartially (1 vs 0)	-0.1081	0.0300	-3.60	0.000	-0.1669	-0.0493

Interpreting these results, companies who have their IPOs partially underwritten are on average 10.81 percent less likely to withdraw their listing. We are 95 percent confident that the average reduction in withdrawal probability is between 4.93 percent and 16.69 percent.

4.2.1.4 Robustness check

The winsorisation of the data had no effect on the estimation of the beta coefficient, the winsorisation of some of the data was conducted to control for outliers and to improve on the overlap. This process did result in some loss of data, but this was accepted after consistency of the beta coefficient was observed and the importance of the overlap assumption was met.

Chapter 5 - Conclusion & Discussion

5.1 News Article Coverage

Our findings support the hypothesis that some level of news coverage helps to overcome information asymmetry, this asymmetry may prevent investors from arriving at their own opinions about the true intrinsic value of the issuing firm and thus aid in the company's dissemination of information. Our findings could also be explained by the increased exposure news coverage has and thus allows companies to gain exposure that they would not have had previously.

Our findings confirm our expectations that news coverage is a positive factor that reduces the company's probability of having to withdraw its IPO. We found that having one or more news articles about the company at the time of its' IPO has a statistical significant effect in the reduction of the probability that a company will withdraw; or conversely stated, having at least one news article has a statistically significant effect, which increases the probability of the company successfully listing.

5.2 Partially Underwritten IPOs

The risk of withdrawal due to undersubscription is removed when a company is fully underwritten. When the IPO is partially underwritten the risk of undersubscription still exists. We assume that the risk of withdrawal should be drastically reduced assuming the proportion of stock underwritten in the IPO is considerable. Interestingly we find that rather than drastic reduction in withdrawal risk our findings show a marginal reduction in the probability of withdrawal.

Further analysis into partially underwritten IPOs and the reasons behind why they companies that choose to be partially underwritten also choose to withdraw would provide the necessary insight into fully understanding this result. A case study on these companies could provide that insight and may be worthwhile undertaking in the further.

Within our dataset almost 20 percent of companies that were not underwritten withdrew their offerings, compared to almost 10 percent of companies that were partially underwritten. The most notable reason that these 10 percent may have withdrawn was to pursue more attractive alternatives, this factor, however, was attempted to be controlled for with the MAWithdraw dummy variable which signified that a company withdrew and then was immediately involved in some M&A activity.

More specifically the 8 companies within the dataset that were partially underwritten, 3 of these companies withdrew and then were immediately involved in M&A activity. Therefore one would assume that the motivation to withdraw for these companies was not because they fail at the IPO but rather that they had a better option elsewhere. When we compared the amount sought in the IPO compared to the amount gained through the M&A activity we saw that 2 of the companies were able to make more than they would have in the IPO; one company looked as though the outcome would not be as favourable as completing the IPO. However, this company may not have proceeded with this M&A activity. As we controlled for M&A activity within out outcome model, it is assumed that this factors effect is removed from the result. Another two companies within this set of 8 ended up cancelling their ABNs. Clearly, this is not a desirable outcome. With one company that was involved in M&A activity, it also had its ABN cancelled, but this may not necessarily be a negative outcome. Thus, this brings us back to the quality factors which is unobservable.

5.3 Limitations and future research

The dataset includes a long period including both hottest and coldest IPO periods, and the timing which had a significant effect on withdrawal was control for within the matching model and the probit model. Withdrawal for many companies is justified by an argument that it was market conditions. Withdrawal represent a failure for investors to arrive at an equilibrium price which is set by the issuing firm. If the valuations of the issuing company are not above their true intrinsic value, then the company has failed to effectively overcome the information asymmetry issue. Potentially some company may be of poor quality, future research could attempt to distinguish these by analysing the survivorship of the withdrawn companies as opposed to companies that complete their listings.

A final limitation for this study was the use of the matching technique, a notable economic assumption is that this technique assumes that private information is irrelevant and thus in adopting the matching technique to answer hypothesis two we have assume that this private information was not a source of endogeneity, future research could confirm our findings by, for example, using an endogenous probit treatment model, or Heckman twostep process.

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